

Amendments to the Claims:

1. **(Currently Amended)** A method for determining a bandwidth required for meeting one or more quality-of-service ("QoS") criterion on a transmission link comprising the steps of:

- generating a plurality of streams of traffic for the transmission link;
- 5 conducting a plurality of simulations of bandwidth for the link, based on generated traffic streams and using systematically varying values of the one or more QoS criterion;
- developing a model addressed to a relationship between bandwidth and the one or more QoS criterion based on the simulations; and
- applying the developed model to determine bandwidth required to meet the one or
- 10 more QoS criterion on a link;

wherein the developed model is provided as a function of bandwidth, traffic load, queuing delay and packet loss.

2. **(Original)** The method of claim 1 wherein each of the generated traffic streams has a fixed traffic bit rate and the traffic bit rate varies from stream to stream.

3. **(Original)** The method of claim 1 wherein the streams of traffic are organized into packets and the traffic streams are defined by packet arrivals and sizes.

4. **(Original)** The method of claim 1 wherein the traffic streams are generated synthetically based on a statistical model.

5. **(Original)** The method of claim 4 wherein the statistical model is a Fractional Sum Difference model.

6. **(Original)** The method of claim 1 wherein the step of conducting plural simulations includes the sub-steps of:

- choosing a trial bandwidth for a given simulation; and
- iteratively repeating the simulation with an incremental change in the trial
- 5 bandwidth until a QoS value realized for the simulation substantially matches a selected QoS criterion.

7. **(Currently Amended)** A method for determining a bandwidth required for meeting one or more quality-of-service ("QoS") criterion on a transmission link comprising the steps of:

- generating a plurality of streams of traffic for the transmission link;
- 5 conducting a plurality of simulations of bandwidth for the link, based on generated traffic streams and using systematically varying values of the one or more QoS criterion;
- developing a model addressed to a relationship between bandwidth and the one or more QoS criterion based on the simulations; and
- 10 applying the developed model to determine bandwidth required to meet the one or more QoS criterion on a link;

The method of claim 1 wherein the developed model is of the form:

$$\log_2\left(\frac{u}{1-u}\right) = \mu + o_\delta \log_2(\delta) + o_\omega (-\log_2(-\log_2(\omega))) + \epsilon,$$

- where u is the QoS utilization, δ is the queuing delay, ω is the delay probability, ϵ is a random variable with mean 0 and variance $\sigma^2(\epsilon)$, μ is a constant for a given traffic
- 15 stream, serving as a summary of the statistical properties of the stream, and o_δ and o_ω are empirically determined constants.

8. **(Original)** The developed model of the form claimed in claim 7 wherein:

$$o_\delta \cong 0.379, o_\omega \cong 0.863 \text{ and } \sigma^2(\epsilon) \cong 0.113$$

9. **(Original)** The developed model of the form claimed in claim 7 wherein:

$$\mu = o + o_\tau (\log_2(\tau) - 24) + \zeta$$

where ζ is a random variable with mean 0 and variance $\sigma^2(\zeta)$ and o and o_τ are empirically determined constants.

10. **(Original)** The developed model of the form claimed in claim 9 wherein:

$$o \cong 5.500, o_\tau \cong 0.709 \text{ and } \sigma^2(\zeta) \cong 0.036$$

11. **(Currently Amended)** A method for determining a bandwidth required for meeting one or more quality-of-service ("QoS") criterion on a transmission link comprising the steps of:

generating a plurality of streams of traffic for the transmission link;

- 5 conducting a plurality of simulations of bandwidth for the link, based on generated traffic streams and using systematically varying values of the one or more QoS criterion;
 developing a model addressed to a relationship between bandwidth and the one or more QoS criterion based on the simulations; and
 applying the developed model to determine bandwidth required to meet the one or
10 more QoS criterion on a link;

The method of claim 4 wherein the developed model is of the form:

$$\text{logit}_2(u) = o + o_\tau \tau + o_\delta \log_2(\delta) + o_\omega (-\log_2(-\log_2(\omega))) + \psi,$$

where u is the QoS utilization, τ is the link bit rate, δ is the queuing delay, ω is the delay probability, $\psi = \epsilon + \zeta$ is a normal random variable with mean 0 and variance

- 15 $\sigma^2(\psi) = \sigma^2(\epsilon) + \sigma^2(\zeta)$ and o, o_τ, o_δ and o_ω are empirically determined constants.

12. **(Original)** The developed model of the form claimed in claim 11 wherein:
 $o \cong 5.500$, $o_\tau \cong 0.709$, $o_\delta \cong 0.379$, $o_\omega \cong 0.863$ and $\sigma^2(\psi) \cong 0.119$.

13. **(Cancelled)** A method for determining a QoS utilization as a function of queuing delay and delay probability for a traffic stream, the method comprising a model of the form:

$$\text{logit}_2\left(\frac{u}{1-u}\right) = \mu + o_\delta \log_2(\delta) + o_\omega (-\log_2(-\log_2(\omega))) + \epsilon,$$

- 5 where u is the QoS utilization, δ is the queuing delay, ω is the delay probability, ϵ is a random variable with mean 0 and variance $\sigma^2(\epsilon)$, μ is a constant for a given traffic stream, serving as a summary of the statistical properties of the stream, and o_δ and o_ω are empirically determined constants.

14. **(Cancelled)** The model of the form claimed in claim 13 wherein:

$$o_\delta \cong 0.379, o_\omega \cong 0.863 \text{ and } \sigma^2(\epsilon) \cong 0.113$$

15. **(Cancelled)** The model of the form claimed in claim 13 wherein:

$$\mu = o + o_\tau (\log_2(\tau) - 24) + \zeta$$

where ζ is a random variable with mean 0 and variance $\sigma^2(\zeta)$ and o and o_τ are empirically determined constants.

16. (Cancelled) The model of the form claimed in claim 15 wherein:

$$\sigma \cong 5.500, \sigma_{\tau} \cong 0.709 \text{ and } \sigma^2(\zeta) \cong 0.036.$$

17. (Cancelled) A method for determining a QoS utilization as a function of queuing delay and delay probability for a traffic stream, the method comprising a model of the form:

$$\text{logit}_2(u) = \sigma + \sigma_{\tau}\tau + \sigma_{\delta}\log_2(\delta) + \sigma_{\omega}(-\log_2(-\log_2(\omega))) + \psi,$$

5 where u is the QoS utilization, τ is the link bit rate, δ is the queuing delay, ω is the delay probability, $\psi = \epsilon + \zeta$ is a normal random variable with mean 0 and variance $\sigma^2(\psi) = \sigma^2(\epsilon) + \sigma^2(\zeta)$ and $\sigma, \sigma_{\tau}, \sigma_{\delta}$ and σ_{ω} are empirically determined constants.

18. (Cancelled) The model of the form claimed in claim 17 wherein:

$$\sigma \cong 5.500, \sigma_{\tau} \cong 0.709, \sigma_{\delta} \cong 0.379, \sigma_{\omega} \cong 0.863 \text{ and } \sigma^2(\psi) \cong 0.119.$$